



## Facilitating User Driven Innovation – A Study of Methods and Tools at Herlev Hospital

**Fronczek-Munter, Aneta**

*Published in:*  
Facilities management research in the Nordic countries

*Publication date:*  
2012

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Fronczek-Munter, A. (2012). Facilitating User Driven Innovation – A Study of Methods and Tools at Herlev Hospital. In *Facilities management research in the Nordic countries: Past, present and future* (pp. 199-214). Polyteknisk Boghandel og Forlag.

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## 5.5 FACILITATING USER DRIVEN INNOVATION – A STUDY OF METHODS AND TOOLS AT HERLEV HOSPITAL

Aneta Franczek-Munter

### ABSTRACT

**Purpose:** To present the preliminary research results of user driven innovation methods at healthcare facilities and their relevance to research and practice.

**Background/Approach:** The paper is based on a case study conducted at the Gynaecologic Department at Herlev Hospital as part of Healthcare Innovation Lab, which is a public-private collaboration project testing the simulation and user-driven innovation between users and companies at Hospitals in the Danish Capital Region. The theories presented are user driven innovation, usability and boundary objects.

**Results:** This article presents different methods used in planning of new hospital facilities and the experiences with using them in practice to improve usability of the built environment. The study focuses on the initial stages of the design processes, specially 'user driven innovation' – the participatory design process in which users are actively involved as co-creators. The paper describes the process and its phases, as well as reflects on the results of the user involvement and specific methods. Depending on the methods used at the workshops the participants/users had different focus, changed the priorities and developed different solutions.

**Practical Implications:** Advice on process and use of boundary objects for future workshops with user groups

**Keywords:** User driven innovation, Hospitals, Methods, Boundary objects, Usability

## INTRODUCTION

Healthcare facilities are recently getting a lot of attention in Denmark, because there are planned 28 hospital projects in next 10-15 years. This includes both new hospital sites and buildings and redevelopments of existing ones. There is also focus on the initial stages of the design processes, specially 'user driven innovation' – the participatory design process in which users are actively involved as co-creators, with the aim of acquiring modern hospitals that support the needs of future patients, healthcare professionals and society.

This article aims at presenting the results of user driven innovation at healthcare facilities, which are particularly relevant and interesting for research and practice, because of the variety of different users and major changes in treatment and technology. Best practice examples of the facilitation methods and objects are also relevant with concluding general advice for future workshops with user groups to achieve innovative and usable building designs.

The paper is based on a case study conducted at the Gynaecologic Department at Herlev Hospital as part of Healthcare Innovation Lab, which is a public-private collaboration project testing the simulation and user-driven innovation between users and companies at Hospitals in the Danish Capital Region. The case study is a part of my PhD project about usability briefing for hospitals, which includes studying the methods and results of user involvement in design. My interest in participating in this case was to observe the ways of involving users in planning healthcare facilities.

The article is structured as follows. First, the relevant theories of user driven innovation, usability and boundary objects are shortly presented. Then, the approach is described. The following section presents the results from the case study and provides further analysis of the different methods and tools used at the workshops in planning new hospital facilities. The experiences and results of using them in practice to improve usability of the built environment are sum-

marised. The process of user involvement is described with the phases, and specific methods and objects used are evaluated. Finally, general conclusions are taken and subjects for further study are drawn.

## STATE OF THE ART

### User driven innovation

According to von Hippel (2005), innovation is nowadays being democratized, and it is no longer just manufactures, but users of products and services that are innovating. In the traditional, manufacturer-centric model of innovation, the users' role is to have needs and the producer's role is to identify them and satisfy them by new products. In a user-centric model, manufacturers invite lead users for usability testing and simulations, where the advanced users can find additional improvements for developing the next prototypes. Furthermore, he claims that most innovating users have characteristics of lead users – they are ahead of the majority of users in their populations with respect to an important market trend.

Ehn & Kyng (1987, in von Hippel, 2005) define *user driven innovation* as introducing a ground-breaking change – now innovation and design is not done 'with' nor 'for' users, but 'by' users! In the recent years, we have seen in some fields that it is truly the users, who are first to develop new consumer products, as the computer software and communication possibilities are steadily growing, resulting in user-centric or user driven innovation (von Hippel, 2005).

The recent research in the Nordic region defines user driven innovation as *"the process in which knowledge is being retrieved from users to develop new products, services and concepts. A user-driven innovation process is based on an understanding of user needs and a systematic involvement of users"* Rosted (2005), Wise and Høgenhaven (2008).

According to Danish Enterprise and Construction Authority (2010), user driven innovation methods can be divided into three groups:

- Lead user approach – first mentioned by von Hippel, where lead users are gathered with the project team at workshops, make rapid prototyping, then R&D department develops the product further
- Ethnographical approach – the aim is to find the needs, both known and tacit, by studying the users in their everyday situations, the used tools can be: observations, workshops, interviews
- Participatory design /innovation – the users are co-designers, methods can vary and are chosen to fit the exact project

Research in user driven innovation has had a strong focus on products and software. As innovation by users is predicted to grow in the society (von Hippel, 2005), it is worth further examining the possibilities of and experiences with user driven innovation in the building sector. Furthermore, the different methods of user participation and involvement like workshops, rapid prototyping, simulations, interviews and observations can be applied in the process of user driven innovation and tested further in different stages of the design process.

### Usability

The concept of *usability* has its origins in product development and the definition by ISO 9241-11 is following: “*The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use*” (ISO, 1998).

Usability has been researched in a number of studies, with different focus topics and a variety of understandings are widespread. The main direction of usability research has been the development of theory and methods to capture and evaluate usability to improve existing facilities and to feed forward to new building projects. As my research is focusing on developing the process of usability briefing for healthcare facilities, I am interested in how to plan the facilities, which are usable for the users. I will therefore in this article use the following understanding of usability (Fronczek-Munter, 2011):

Usability of a building is a quality, where

- the building supports and shelters the users and their activities, buildings true purpose (Blackstad, et al 2010).
- contributes to efficiency, effectiveness and satisfaction of user organisations, (ISO, 1998 reformulated by Blackstad, et al 2010).
- depends on context, culture, situation and experience (Alexander, 2008, 2010)

is, unlike functionality, a matter of subjective view of users (Alexander 2005, 2008, 2010, Jensen 2010).

The literature shows a possible focus shift towards usability and *user involvement*. Alexander suggests that to improve usability “*users must be empowered and communities must be offered the opportunity of meaningful involvement*”. He argues that there is needed a change of perspective, “*from building and its production, to users and the community*” (Alexander, 2010). If the *Usability* of future buildings shall be improved in general, there should also be focus on Usability in preliminary design stages for facilities, for example in *idea generation* and *briefing* for new built environments. The important role of briefing on the final result of built environment was stressed in various publications, for example by Barrett and Stanley (1999) and Blyth and Worthington (2001), Jensen and Petersen (2009) and REBUS project (Blakstad et al, 2010). Recent work by CIB W111 on usability highlighted the importance of briefing as a means to achieve usability. The characteristics of traditional, inclusive and usability briefing were listed by Jensen et al. (2011). Furthermore, there are a number of common issues of *usability* and *user driven innovation*, which lead to conclusion that *user driven innovation* can be seen as one of user involvement methods to achieve *usability* of planned facilities (Fronczek-Munter, 2011).

### Boundary objects

The term *boundary object (BO)* was developed by Star and Griesemer (1989) as a concept of problem solving by means of translation.

Boundary objects are described as media of communication between communities. They can be abstract or concrete objects that arise over time from durable cooperation and understood or misunderstood in equality between the participants. The concept has been described further by several researchers, eg. Clarke and Fujimura (1992) define boundary objects as including things, tools, artefacts and techniques, in addition to ideas, stories and memories of community members. Several researchers, *e.g.* Kjølle and Gustafsson, (2010), Carlie (2002, 2004), Wenger (2000) and Broberg et al. (2011) have been studying the use of BO in literature reviews and case studies of briefing and design processes or product development, and concluded with dividing them into following types and categories:

- Repositories (ie. cost databases, parts libraries),
- Standardised forms and methods (ie. drawings, handmade sketches, lists of problems, questionnaires),
- Objects, models and maps (ie. slideshow, CAD 2D-3D, fishbone chart, mock-ups),
- Discourses (ie. questioning situation, typical action situation),
- Processes (ie. prototyping, visiting other departments)

In addition to that, Broberg et al. (2011) made a list of characteristics of boundary objects. The 4 most relevant for this case analysis are the following:

- BO are not ready made, but objects-in-the-making, need to be created by participants
- BO have built-in affordances, possibilities for action, interaction instruments
- A facilitator of the events selects the BO, develops rules and instructions and guides the workshops
- BO are used in discrete events, workshops with a temporary learning space, enable a collaborative design process, enable participants into "design mode"

Several other publications on boundary objects can be studied further, Boujut and Blanco (2003), Vinck et al. (1996), Wenger (2000).

## METHOD / APPROACH

I will use the concept of boundary objects in an understanding of different tools and objects used in workshops. My criteria for analysing and evaluating results with BO are the following: First, how well do they help communication and innovation? Are they easy to use and understand for all participants? Are they bringing new ideas? Second, what is the effect of BO on design solutions?

The three theories described in the previous section can be combined to describe and analyse the case study. In the case study, the involvement of users was executed as a user driven innovation process. Furthermore, the boundary objects were used as tools at workshops and the goal, among others, was to generate ideas for a new workplace, a healthcare facility of high usability.

I, as a Ph.D. student at the Technical University of Denmark, participated in the HIL A project as one of the facilitators, whose role was mostly to observe and facilitate the process, but at few events we were also participants and co-creators of the result. It means that user driven innovation is then of two types: design “by users” and sometimes “with users”. Compared with the traditional design “for users” the case provided an excellent best practice of the extensive user involvement.

RESULTS FROM CASE STUDY

This section will present the case study. First sub-section includes general information about the case study. In the next sub-sections the three phases of the HIL project A process will be described separately. For each phase the characteristic methods, tools and boundary objects used in the workshops will be described with accompanying reflections on the process. Each phase findings are the evaluations of the methods and objects, as well as their impact on the design results. The last sub-section presents general findings and conclusions about the whole process and involved users.

Description of the case – general information HIL

The case study was conducted at the Gynaecological Department at Herlev Hospital as part of Healthcare Innovation Lab (HIL). HIL is a development project which aims to demonstrate the feasibility of establishing a permanent healthcare innovation laboratory. It involves users, hospitals, scientific and research institutions, patients and relatives, as well as companies. The users at HIL are widely understood as the medical staff. The HIL project is funded by the Danish Enterprise and Construction Authority’s program on user driven innovation.

Figure 1: Chronological overview of the process and methods at HIL project A



In the beginning of 2010 the objectives and success criteria of the HIL project and its part projects were specified. The studied case is the HIL project A, focusing on functional and organisational planning of hospital facilities. It consisted of observations, workshops and simulations with users at the Herlev Hospital in the period September 2010 – June 2011. The chronological overview of the process and methods is presented in Figure 1.

### **Description of process and findings of Phase 1 – Exploring**

At the first meeting the facilitators and users discussed the developing of a future concept. It was important for the group to start with an agreement on the aims and expectations, so the planned activities would run smoothly.

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The methods and boundary objects used were post-its with written individual wishes and comments, which were placed on a round bull-eye target poster in order to communicate and prioritise the needs of both groups (Figure 2). The result of the prioritising game 1 about expectations was a set of rules and agreements for further observation at the department, staff and patient involvement in the project. It provided a common understanding of the special legal and ethical conditions of user involvement at the healthcare facilities with respect for clinicians, patients and relatives. It also secured goodwill of cooperation with the user team. The boundary objects seemed to be easily understandable and fitted to the task.

Workshop 2 was an exciting experience for all participants, where the user group and the facilitators were innovating together. The goal was defined as: creating visions for future, defining patient flow in steps through department and prototyping of treatment room. The workshop was loosely structured and the roles of participants were not defined clearly. The boundary objects were blank posters, colourful post its, markers, Duplo figures and blocks. The workshop was very productive, but created opposite and unpredictable results from the two subgroups. One user group was bound to present reality, while defining the patient steps through physical design, but was innovative in prototyping phase and future patient types/needs. They invented a Royal Model, where medical staff comes to a patient room with mobile equipment instead of patients going around the department for specific treatments. The other user group, on the other hand, had untraditional visions, but reduced them to traditional solutions when doing prototyping. The positive conclusion was that in general it is possible to change and innovate with staff and the workshops are very productive. The critical conclusions of the facilitators were the awareness of a need for clearer rules to user exercises in future workshops and the need of clear roles for both users and facilitators. Another critical conclusion was the need for a more specific definition of expected aims and structure of each exercise to achieve a uniform result, as the user groups seemed a bit too free and unfocused at times. Nevertheless, the workshop resulted in some useful results: defined a typical patient flow in steps, provided with some expectations of future patient types and needs and invented a Royal model concept.



The following step was a number of observations at the department (Figure 2), where the facilitators observed specific topics: staff-, patient- and journal-flow and how well the physical environment supports the activities. The individual lists of issues on the three topics were gathered into a common list of challenges in the department. The facilitators achieved a better understanding of the daily routines and issues that need to be addressed in the future plans. The following presentation of the list of challenges in a short and condensed form was recognised by users as an understanding of their recent position and the need of changes.

**Figure 2: Phase 1 – Exploring, 1 – Workshop about expectations and 3 – Observations at the outpatient department**



The Boundary Objects used in the phase 1- Exploring were of three categories. The first two workshops used *objects*: posters and post its. The third activity, the department visit, was of BO category *processes*, but also used the *standardised forms* in the lists of issues. All of the BOs were easily understood by the users and had strong characteristics of BO – they were actively created by participants, gave possibilities for action, and enabled participants into “design mode”. The facilitators learned the fourth important characteristic of BO during the workshops – the need of rules and instructions.

### **Description of process and findings of Phase 2 – Development**

The next stage was a new series of 4 workshops with users which took place at Herlev Hospital. The facilitators prepared the process thoroughly at meetings beforehand and chose potential best tasks, tools and objects that can ease the collective process of communication and design. The expectations to outcome were addressed as well. The facilitators took single roles to play – some were structuring the meeting, some asking questions to specific topics, some were observing and taking notes and some videotaping. The users exclusively discussed the future needs and designed the future possible solutions with each other. The facilitators could inspire or provoke for other solutions than mentioned, but it was the users taking decisions and working on the design. The boundary objects were paper posters, post its and markers and the facilitators were guiding the users through the task by asking relevant questions and helping drawing the maps according to the given answers.

The results of the event 4 were communication maps showing the variety of tasks involving others, different to each specialisation. Exercise 5 resulted in an overview of different task processes of the specialisations. Finally the break downs were identified and marked visually on both of the maps. The conclusion after the tasks 4 and 5 was that structuring the process and roles was helping to gain a comparable result for each user group. The process maps- 5 showed also how the view on the patient flow and staff process varies and depends significantly on belonging to particular professional group of the medical staff.

The workshop with design games – 6 and 7 – was very productive and remembered by all participants. The first task for users was a design game called Ovals – 6 – or Flower. The boundary objects were a poster with abstract oval forms, small papers with icons/photos/names of rooms, and a possibility to make new ones and placing them according to users' own rules and common agreements. The task was to translate the drawing freely and organise the functions accordingly (Figure 3). The participants were very excited and discussed the understanding of the task and possible solutions. The ideas were innovative and discussions covered both physical and organisational topics. The result was a design of 3 levels with common areas in a central position, and all patients arriving at the same place. Another new idea was a command bridge with a coordinator.

The next design game was Squares – 7. It was meant to continue and further detail the solutions from previous exercise. The boundary objects were also a poster, but this time with a square grid printed on it, yellow and blue squares, icons and names for room functions and Duplo person figures to play staff or patient flow through. The task for the user group was to distribute functions and rooms and organise them with yellow squares for rooms with access to staff only, and blue squares for areas with patient access (Figure 3). The participants felt more restricted by more realistic square rooms, and only one level solution, but tried to keep and translate previous ideas to new rules – kept the central place and many related functions close to each other.

The design results of the exercises 6 and 7 was a functional plan of rooms, first divided in 3 levels, then forced to 1 level, defined physical proximity of functions, corresponding to wishes of the group and imagined expectations of the future patient. Another, unexpected result was a list of needed organisational changes for the future and the awareness of many assumptions and preconditions to organisation, technology, etc. Those were listed by the facilitators on a separate poster while the users discussed the issues.

Phase 2 used BOs of several types. The *Standardised methods* were drawings and handmade sketches. The *Objects and maps* examples were communication map, printed posters, Duplo person figures. There were also following *Repositories*: parts libraries in form of icons, names and pictures for rooms. Another type of BO was *Discourses* in the form of typical action situation in tasks 4, 5, 6 and 7 or questioning situation in design games 6 and 7, where the standard design and organisation solutions were questioned and new ones provoked. All BOs used in phase 2 worked well as interaction instruments with the given rules and enabled a collabo-

rative design process. They were prepared by facilitators and were created by users during workshops. The combination of boundary objects in form of well prepared design games with Objects and Discourses was the most entertaining, productive and innovative.

Nevertheless, the designing process with ovals – 6 – seemed more playful for the users and more frustrating when using squares – 7. The interesting question is what was special about the design game 6 and 7 that the group responded so differently to them and the innovative results seemed easier/harder to obtain? The boundary objects and the task seemed quite similar, but it was much easier for the users to freely distribute the functions, have an overview of the whole department and innovate in the abstract oval forms, than in the more realistic squares. The conclusion is that the abstract BOs were more playful, free and easy to use and enabled the users into "design mode" easily. The BOs in squares on the other hand, were more serious and started many new discussions about details, for example access to daylight and the solutions changed several times depending on the current focus.

**Figure 3: Phase 2 – Development, 6 – Ovals design game, 7 – Squares design game**



The general conclusions from phase 2 are the following. First, the tasks for users shall be structured and planned in advance and boundary objects chosen carefully to give the expected type of results, which can be for example more innovation and new ideas or specifications of details and prioritising of focus areas. Furthermore, the facilitators must be open to hear also other relevant results than planned, and support them too – here the facilitators got aware of a new topic with preconditions and started listing it simultaneously on another poster.

### **Description of process and findings of Phase 3 – Validation**

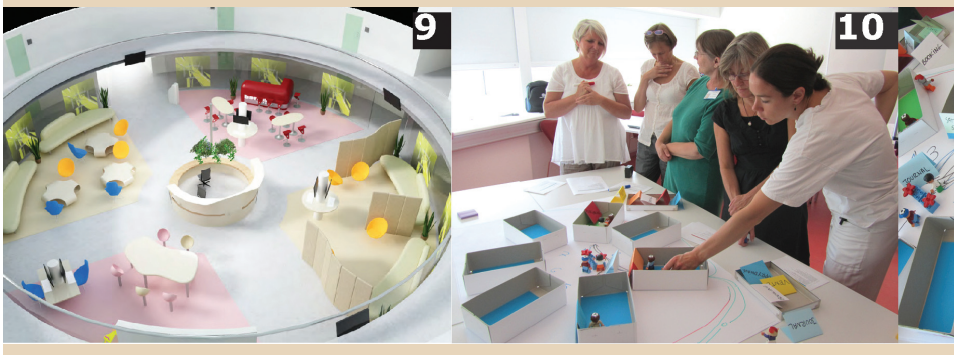
At workshop 8 – square concept validation – the results from previous design game were developed further and validated through playing specific patients' flow through them. The boundary objects were the previous posters with room arrangements, but included also typical patient stories to be played through a Duplo person that was being moved around the plan. The finding from that workshop is that the patient stories and the playing of the real patient through the future hospital helped the participants to change and optimise the plan further to fit as many

patient's and staff's future wishes and needs as possible. On the other hand the changes were minor and innovative spirit was missing.

The task 9 – 3D – design aimed at further validation and development of the users' concept for the future facility. The boundary objects used were 3D visualisations of specific areas in the future department (Figure 4). The pictures and plans were prepared beforehand by the facilitators and students according to the notes from the previous user workshops. It seemed to be a great start of new discussions about new topics like the atmosphere and look of the areas, the organisational issues together with interior details and furniture, as well as technical solutions to medical treatments and glass doors. The reality of the pictures allowed the user group to make their previous thoughts more precise. The users presented their results to the department management. The facilitators prepared the slides with updated notes on specific topics and the updated visualisations of the specific rooms. The group seemed very content to see their results looking so professional and real and were very engaged in telling the story. The structured and visual presentation slides may also have eased the process of presentation and explanation of the complex problems and solution ideas. Unfortunately the photorealistic 3D visualisations of the solutions had a weakness of focusing on the room sizes, furniture design and colours, and not so well showing the innovative solutions of the users, which were the organisational changes, proximity and arrangement of functions. If both should be represented in a professional way, then the user group should have had the designing architects involved in the workshops too.

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**Figure 4: Phase 3 – Validation, 9 – 3D design, 10 – Simulations**



The last event type was a number of simulations – 10. The boundary objects in simulations were paper sheets, empty boxes representing rooms, colourful post its, markers, Duplo figures representing patients and medical staff, egg timers, typical patient flows and typical disruptions. The tasks were to arrange the room boxes on the table and play typical patient flows through department in steps with specified time use (Figure 4). The users and facilitators were playing one figure at a time, moved it between the rooms, drew the walking lines with markers and set the allowed time for each step with the timers. Time in the simulations was played with the

speed x3, so the simulations were fast. The first simulations were representing single patient, doctor, secretary and nurse, but later the number of participants was 10-15 and more realistic. The aim was to test the basic models of functional and organisational plans and evaluate the effectiveness, quality and overview. The exercise was very dynamic and quickly the previous solutions were abandoned and new ones developed by the group. The Royal model from phase 1 was tested too and found ineffective, because of waste in staff time use. Several other concepts and new "what if" ideas were tested. The common reflections of users and facilitators led to development of a new model – the "star concept". It has a coordination function, like in phase 2, now placed in the central room for medical staff. From here the doctors and nurses have access to the patient's examination rooms arranged around it, in which the patients stay for both the conversations and examinations. The central coordination room is innovative for outpatient clinic both functionally and organisationally. It was easy to make an immediate simulation of the new concept and later test it with users from other hospitals that proved its potential qualities.

The boundary objects in phase 3 were various. Exercise 8 reused "old" BOs from squares – 7 – and was lacking innovation. The 3D models – 9 – were not made by the users directly, their ideas were translated and modelled by others. The table simulations – 10 – were flexible, quick, easy to use and surprised by not only allowing the quick tests of models, but also the strong potential for new innovations. The validation of concepts, turned into innovation and development of new, improved concepts.

### **GENERAL FINDINGS – PROCESS AND USERS**

The workshops concentrated on the physical environment. The facilitators got aware that most of the workshops actually had not one, but several parallel themes of innovation. They could be divided into 3 themes:

- physical environment, rooms, needs, qualities and locations, functional plan
- organization, professional roles and activities,
- preconditions for the future solutions,

The finding was that some of the organisational roles have to be redefined and there are a number of political and technological preconditions for the future solutions to be possible to achieve and turn the basic functional schemes to hospital of high usability.

Each workshop and the used boundary objects, previously described in the phase descriptions are summarised and evaluated in Figure 5.

The active workshop participants in the HIL project A can be divided into two groups: users and facilitators. The users in this case were the medical staff including doctors, nurses and medical secretaries, while the facilitators were researchers, consultant companies and various specialists. There were also professionals, who followed only parts of the process as observers, i.e. management from the department and the architect representing new building processes at the hospital, responsible for the client briefing process, competition and coordination with external architects and designers.



**Figure 5: Overview of workshops at HIL project A, used boundary objects and their evaluation**

Photo	Name, BO	Evaluation of Boundary Objects
	<b>1 Expectations,</b> Bull-eye target poster, post its, markers	Easy to use actively, communicate and prioritise, making common agreements
	<b>2 Patient flow,</b> Post its, markers, room prototyping	Innovative visions - Royal Model, traditional physical design, uneven results in groups, need for rules
	<b>3 Observations,</b> BO Process: Observing, hearing stories, listing of issues	Better understanding of the department, list of challenges,
	<b>4 Map of Communication,</b> Blank poster, drawing arrows showing communication	Easy to make, gives overview of tasks and communication between people, breakdowns
	<b>5 Patient flow,</b> Colourful post its, markers, notes, arranging steps – fishbone chart	Productive, easy to arrange patient steps and staff tasks – overview
	<b>6 Design game Ovals,</b> Poster with abstract ovals, icons and photos of rooms	Flexible, playful, free task, result: innovative ideas to organisation and building, users in "design mode"
	<b>7 Design game Squares,</b> Square grid, room icons, colourful squares	Restricted to reality, serious, frustrating, details development of functional plan, discussing the building
	<b>8 Square concept validation,</b> Square rooms, patient flow, Duplo figures	Small changes in arrangements, optimisation, no innovative spirit
	<b>9 3D design,</b> 3D visualisations of chosen areas	Discussing details, furniture, atmosphere, immediate changes by participants not possible, professional look
	<b>10 Simulations, Room boxes,</b> Duplo figures, patient flow, disturbances, egg timers	Testing basic models & innovating, easy, quick to test usability, organisation and functionality, new scenarios

There were no patients or architects involved actively in the workshops. There were users participating only in some workshops, e.g. the Senior Hospital Physician at the event 1 and 2, which disturbed the continuity of the user involvement process, as the Royal Model did not get support and ownership from the new user group. The observing architect, representing the client was not co-creating the results, which could have been helpful in the designing and 3D modelling, which in this case was done by others, who were neither part of the group, nor the responsible architects. Moreover, the competition for new facility was already running at the time of the workshops, so the designing architects already received a functional brief, but also couldn't participate in workshops, as there were several competing companies.

There are several types of users of the built environment. Recent research organised them in some groups, depending on various criteria. Kernohan et al (1992) divides them into demand and supply side, Alexander to client-buyer, Norwegian studies, like Haugen 2008, Sæbøe and Blackstad 2009 – mention the user, the owner, the facilities manager. The article "Who is the user?" (Olsson, N.O.E. et al. 2010) divides the users into 6 user categories, including client organisation professionals, service providers and receivers.

Users actively involved in the case were limited when looking at the panorama of potential users. The workshop participants were mostly medical staff. Patients were not involved at all in the workshops, but were represented alone in the focus of staff on patient needs and types and a few interviews. There are several other types of users of the built environment mentioned in literature and some groups were strikingly missing at the workshops, for example the architects and FM Managers or support staff.

I see a broad picture of the users/stakeholders in hospitals. Apart of medical staff, there are patients and their relatives, client organization (managers, facilities managers and architects), support staff and various external consultants (architects, engineers, designers, work environment specialists etc). The society is an important user in two understandings. First, the individuals are potential patients and relatives, or users of hospital facilities, e.g. public spaces, meeting rooms, cafes. Some are direct neighbours. Second, society is an owner of public hospitals as taxpayers and voters, organised in governmental, state and regional authorities as well as media.

## CONCLUSIONS AND PRACTICAL IMPLICATIONS

After the series of workshops with user groups, some main conclusions can be made. The series of workshops had 3 phases and each resulted in a main innovative idea. The exploring phase resulted in a Royal Model, where the different doctors visit the patient's room. Phase 2 developed the Coordination Bridge and central room for patients. The Validation phase 3 not only tested the previous models, but further developed them into a new Star Model, with central room for medical staff and coordination.

Depending on the methods used at the workshops the participants/users had different focus, changed the priorities and developed different solutions. Some of the BOs, the Ovals design game – 6 – and Simulations – 10 – were most innovative. Both can be characterised by being flexible, open for translation and abstract. The conclusion is that those BOs were more playful, free and easy to use and enabled the users into "design mode" with focus on future needs and design of innovative solutions. On the other hand, other BOs, as Squares – 7 – and 3D design – 9 – were more serious and seemed to lock the participants to current situation and details or were more demanding.

The users actively involved in the case workshops were extremely limited when looking at the panorama of potential users and did not include patients, architects or facilities managers. The user categories at hospitals could be studied further with their potential roles in the planning of new facility and type of involvement.

The use of the workshop results at HIL could also be studied more thoroughly. The workshops in the case did not result in usability briefing; the architectural competition was running parallel already. Nevertheless the results might be used in future workshops with the architects that won the competition for the new hospital. The question to be answered is: how will and could results of such workshops be used?

My recommendations for future workshops about planning hospital facilities are following. First, start the process early, so the results can be used for competition brief. Second: invite a broader range of users and keep the same people in the group. Furthermore, make a strategic plan of user involvement, some shall be actively involved, some only informed and some make decisions. Moreover, plan the aims of each workshop exercise, structure the tasks and roles of individuals, and finally choose the tasks, games and boundary objects carefully to fit the expected focus and type of result.

Further study is recommended in other methods of user involvement for briefing for new facilities apart of involvement in design workshops and simulations. Another method, which was not tested, is evaluation of buildings in use. All relevant methods could be described and results compared. The questions to be answered are: Which methods could improve the design processes with the ambition of creating better and innovative buildings of enhanced usability? How optimal process could look like?

## ACKNOWLEDGMENTS

I gratefully acknowledge Centre for Facilities Management – Realdania Research and Technical University of Denmark, Department of Management Engineering for financial support of my Ph.D. project. I thank the people at HIL project A and workshop participants from Herlev Hospital, DTU Management Engineering, Grontmij and The Capital Region of Denmark for making my empirical study possible.

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